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Who is laughing in the end?

Examining Family SES and Family Support as mediating factors in the association between different family structures and laughing gas use among a representative sample of Dutch adolescents

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Abstract

Background: in the last past decades laughing gas became more popular among adolescents, which can cause negative health outcomes. To gain more knowledge, risk factors for this use need to be identified. This study examined the association between growing up in different family structures and laughing gas use among adolescents and the extent to which this association is mediated by family SES and family support. **Methods:** For the present study, data from the Dutch Health Behavior in School-aged Children (HBSC) has been used. The sample used for this study consisted of 8912 adolescents. The distribution of respondents living in each family type is as follows: ‘intact’ ($n = 6971$), ‘single mom’ ($n = 1017$), ‘single dad’ ($n = 178$), ‘stepparent’ ($n = 498$). Logistic and linear regression analyses were performed to test research question. **Results:** Compared to intact-families, adolescents of single-mother-families, single-father families and stepparent families were more likely to have ever used laughing gas than adolescents from non-intact families. There is no significant difference between the different non-intact family structures. We did not found a mediation effect of family SES on the association between different family structures and laughing gas use. However, we did found a mediating effect of family support. Adolescents who experience more family support were less likely to use laughing gas.

Keywords: family structure, family composition, substance use, laughing gas, family support, family SES, adolescents

Samenvatting

Achtergrond: de afgelopen jaren is het lachgas gebruik onder jongeren steeds populairder geworden wat kan leiden tot negatieve gezondheid uitkomsten. Het is nodig om meer informatie te krijgen over dit onderwerp en risicofactoren voor het gebruik moeten geïdentificeerd worden. In dit onderzoek is gekeken naar het verband tussen het opgroeien in verschillende gezinsstructuren en het ooit lachgasgebruik onder adolescenten. Daarnaast wordt gekeken in hoeverre dit verband wordt bemiddeld door familie SES en familiesupport.

Methoden: Voor deze studie is gebruik gemaakt van data van de Nederlandse HBSC-studie uit 2017. De data bestond uit 8912 respondenten. De verdeling van de respondenten die in elk gezinstype woont is als volgt: intacte families (n = 6971), alleenstaande moeder families (n = 1017), alleenstaande vader families (n = 178) en stiefouders gezinnen (n = 498). Logistische en lineaire regressies zijn uitgevoerd om de onderzoeksvraag te testen. **Resultaten:**

vergeleken met adolescenten van intacte families, hadden adolescenten van alleenstaande moeders, alleenstaande vaders en stiefoudergezinnen vaker ooit lachgas gebruikt. Tussen de verschillende non-intacte familiestructuren was er geen verschil gevonden in lachgas gebruik. Adolescenten van non-intacte familiestructuren hadden een lagere sociaaleconomische status. Echter, bleek er geen mediërend effect van sociaaleconomische status te zijn. Adolescenten van intacte gezinnen ervaarden meer support van hun ouders wat leed tot minder lachgasgebruik.

Steekwoorden: familiestructuur, familiesamenstelling, middelengebruik, lachgas, familiesupport, sociaaleconomische status, adolescenten

Introduction

Adolescence is a period that is associated with an increase in risk behavior such as substance use and sexual risk behavior (Jackson et al., 2016; Kleinjan & Engels, 2010). The recreational use of nitrous oxide (N₂O) has risen substantially in the last past years among adolescents in the Netherlands (NDM, 2019). This substance is also known as laughing gas. In 2015, 8% of the adolescents between 12 and 16 years reported using laughing gas (Verdurmen et al., 2016). In 2016, more than 50% of young adults in the age of 15 and 35 year reported ever have used this substance. 37% of them have used it in the last 6 months (Monshouwer et al., 2016). The use of this drug became popular very quickly through parties and festivals (Nabben & Korf, 2014; Kaar et al., 2016; van Dorsselaer et al., 2016). In the Netherlands, it is easy to obtain laughing gas because it is a legal substance that falls under the commodity law which makes it easy to obtain (Keukeleire et al., 2017; Luijk & Nijkamp, 2019).

Regular use of laughing gas has shown that it may lead to different health consequences such as a reduction of vitamin b12, dizziness and headaches (Bruin et al., 2019; Luijk & Nijkamp, 2019; Punwasi & Rijkels-Otters, 2020). Although the number of health incidents involving laughing gas is limited in the Netherlands, especially the combination with the use of alcohol and other drugs can be dangerous (Van Goor, 2018). Additionally, cord disease as result of a reduction of vitamin b12 because of laughing gas is more present now in clinical practice (Bruin et al., 2019). Considering the risk of laughing gas use, it is crucial to know which adolescents run a high likelihood of using it.

Family structure is an important predictor of substance use among adolescents (Griffin et al., 2000; Korhonen, et al., 2012; Schleider et al., 2013; Vanassche et al., 2014). Adolescents who grow up in intact families are less likely to use substances than adolescents of intact families (Bjarnason, et al., 2003; Hemovich et al, 2011; Jovic et al, 2014; Plevová & Hlávková, 2016; Vanassche et al., 2014). As around 20% of the Dutch minors are living in a non-intact family (Loozen & Harmsen, 2018), more research on the effect of different family structures is warranted. A distinction can be made between intact families and non-intact families. Intact families are families where both biological parents are present, while this is not the case in non-intact families. Within non-intact families there are different types: single-mother families, single-father families and stepparent families.

Research on laughing gas is scarce while there is a lot of research about other substances like alcohol and cannabis use (Jovic et al, 2014; Plevová & Hlávková, 2016; Vannassche et al., 2014). It is important to decrease the use of laughing gas among adolescents and risk factors for this need to be identified. Considering the high percentage of adolescents who do not grow

up in intact families nowadays and the previously revealed linkage between family structure and substance use, this study focuses on the association between family structure and adolescent laughing gas use. Therefore, the association between different family structures and laughing gas use among young adolescents is investigated, as well as family SES and family support as mediators in this association.

Substance use as coping strategy

The stress-coping theory (1984) suggests that substance use is a coping response to life stress. People experience all kinds of problems throughout life and to manage these problems, people try to cope with this through behavioral or cognitive responses (Lazarus & Folkman, 1984). Coping can be defined as a way in which an adolescent approaches a challenge (Menaghan, 1983). The goal of coping is to maintain physical and psychosocial well-being (Folkman & Lazarus, 1988).

Scientific research on the association between family structure and substance use

According to Amato's (2000) divorce-stress-adjustment perspective, a parental divorce or separation could be a stressful period for an adolescent. An important aspect of this perspective is that this period is seen as a process. This process is mediated and moderated through different stressors and protective factors. Decreased involvement of one of the parents, an introduction to a new stepparent and diminishing economic resources are factors that can increase risk behavior (Amato, 2000; Coleman, 2013). Besides, also widowhood is a stressful life event. This situation can be compared with the experience of a divorce (Lin & Brown, 2020).

Different family structures are exposed to different stressors. The risk of experiencing various stressors varies by family composition (Gore et al., 1992). Stressful experiences are often correlated to adolescent's substance use (Hsieh et al., 2014). Adolescents tend to use substances in order to cope with these various stressors (Hussong et al., 2011). Several studies have revealed that adolescents who grew up in incomplete families (single-mother families, single-father families or stepparent families) were more likely and at higher risk to use substances (Gordon et al., 2020; McArdi et al., 2002; Vannassche et al., 2014). A formation of a new family where the child lives with one of his biological parents and a stepparent is an example of a stress factor for the child, which could lead to more substance use (Shafer et al., 2017). Furthermore, some previous studies have focused on single-parenting and substance use among their children. Adolescents from single-parent families were at higher risk of substance use (Ewing et al., 2015). Moreover, substance use of adolescents from single-parent

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families seems to be more problematic (Conway et al., 2013; Hemovich & Crano, 2009). Besides, research suggested that there is a difference between substance use among adolescents from single-mother families and single-father families. Doran et al. (2019) found that adolescents who grow up in a single-mother family were more likely to use substances at a younger age. However, there is also some evidence that adolescents from single-father families are more likely to use substances (Hemovich & Crano, 2009; Hemovich et al., 2011). Moreover, also living with a stepparent increases the risk of substance among youth (Bjarnason et al., 2003; Conway et al., 2013).

Mediating effect of family SES on the association between family structure and laughing gas

Family socio-economic status (SES) could have a mediating effect on the association of family structure and substance use (Gustavsen et al., 2016; Jones et al., 2016). The association between SES and adolescents' substance use has been investigated. Intact families have more financial resources than non-intact family structures. It is more economically difficult to reach a high living standard for single-parent families than for intact families because of the living costs (Gustavsen et al., 2016). According to Jalovaara (2000), adolescents with a low SES are found to be more likely to live with only one of their parents. In fact, growing up in a single-mother family is associated with a lower socioeconomic status (Richter & Remole, 2017). A disruption of a family household leads to diminishing economic resources and material prestige which may also lead to an increase in risk behavior (Amato, 2000; Bjarnason, 2003; Coleman, 2013). Families with a low SES also have less resources to learn their adolescents the right coping skills in order to deal with these stressors (Doane et al., 2012) which make them more vulnerable to use substances (Coleman, 2013). However, according to Kendler and colleagues (2014) a high socio-economic status predicted an increase in substance use in early adolescence while lower SES predicted risk behavior and substance use such as alcohol use more in late adolescence (Ferraro et al., 2016).

Mediating effect of family support on the association between family structure and laughing gas use

Parental support has been defined as "the affectionate qualities of parents associated with warmth, acceptance and involvement." Parental support is important to make a stable and healthy transition from childhood to adulthood (Newland, 2014). The amount of parental support differs for different family structures (Huver et al., 2010). Single-parent families have

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less resources to invest time, money and emotional support to their children in comparison with intact families (Cavanagh & Fomby, 2019; Cooper et al, 2009). They found it more challenging to provide parental support (Hill, 2011). A lack of parental support increases the risk of adolescents' substance use (Becona et al., 2012; Vermeulen-Smit et al., 2015). Adolescents that receive less parental support, perceive certain situations as more stressful (Agnieszka & Zalewska, 2011). Adolescents who live with their single-mother experience less parental support compared to single-fathers (Bastaitis & Mortelmans, 2016). Moreover, children who live with their father, regardless if he was single or had a new spouse, experience more paternal support than intact families.

This study

Based on the previously discussed literature, we formulated four hypotheses. First, we predict that family structure is a predictor of laughing gas use among adolescents. The first hypothesis is that adolescents from different non-intact family structures are more likely to use laughing gas than adolescents from intact families. Secondly, we hypothesized that there is a difference in laughing gas use between adolescents from different family structures. Furthermore, the third hypothesis states that adolescents of non-intact family structures have a lower family SES which leads to more laughing gas use among them. Next, we expect that different family structure influences the amount of support adolescents experience. The last hypothesis is that adolescents of different non-intact family structures perceive less family support than adolescents from intact families which leads to more laughing gas use.

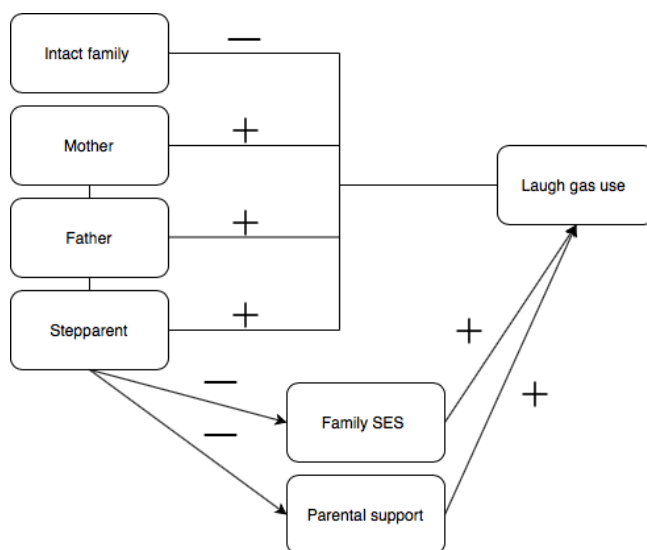


Figure 1. Research model

Methods

For the present study, data from the Dutch Health Behavior in School-aged Children (HBSC) has been used, which is a cross-sectional, nationally representative study conducted every four years among adolescents in the age of 11 to 16 years. Data for this study is collected in October and November 2017 anonymously by using digital self-completion questionnaires.

The HBSC study used a two-stage random sampling procedure in order to obtain the sample. The first stage was to randomly select schools for regular education in the Netherlands. A total of 187 primary schools and 232 secondary schools were approached to participate in the study, from which 72 primary schools (a response rate of 39%) and 85 secondary schools were willing to participate (a response rate of 37%). Next, each participating school was asked to provide a list of all classes from which 3-5 classes were randomly selected. A total of 8980 students in primary and secondary school participated in the HBSC study. The sample used for this study consisted of 8912 adolescents. The average age of the participants is 14,6 years (SD = 1.66). 48.5% of the participants are boys and 51.5% of the participants are girls. The distribution of respondents living in each family type is as follows: 'intact' ($n = 6971$), 'single mom' ($n = 1017$), 'single dad' ($n = 178$), 'stepparent' ($n = 498$).

The HBSC study used passive consent from the parents. Students received an information letter for their parents with information about the research. If there were any objections, parents could make this known in different ways. Students could fill in the questionnaire during school time under supervision of research assistants of the Trimbos Institute. Ethical approval was gained from the Ethics Committee of the Faculty of Social Sciences at Utrecht University in 2017 (FETC17-079).

Instruments

The independent variable in this study is family structure. Family structure has been measured by the question: *'tick the box(es) that describes the people that live in the house you are most of the time.'* Participants could choose different people such as their mother, father, stepmother and stepfather. Combining these answers enabled us to distinguish between: intact-families (i.e. father and mother), single-mother families, single-father families and stepparent families.

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Laughing gas use is measured with the question ‘*have you ever used laughing gas?*’. Participants could answer with: 1 = never, 2 = one or two days, 3 = three to five days, 4 = six to nine days, 5 = ten to nineteen days, 6 = twenty to twenty-nine days, 7 = thirty days or more. However, this variable is made dichotomous (0 = never used laughing gas and 1 = ever used laughing gas).

Family SES is measured by the variable FAS_III. The HBSC study uses a continuously developing questionnaire of the Family Affluence Scale (FAS). The FAS is used as a proxy for SES which has been proven to be valid and reliable measure (Liu et al., 2010). How higher the score on this variable, how higher the SES of the family. Respondents were asked to answer 6 items respecting car ownership, own bedroom, computer ownership, number of bathrooms and owning a dishwasher.

Family support is the perceived support adolescents receive from their parents. This variable is measured by a seven-point Likert scale where a higher score means more family support. Respondents got statements like: ‘*at home I can talk about my problems*’. This variable is measured on a seven-point likert scale ranging from 1 = strongly disagree to 7 = strongly agree.

The control variables of this study are *gender* and *age*. Gender is measured by the question: ‘*are you a boy or a girl?*’ where 1 = boy and 2 = girl. This variable is made dichotomous where 0 = girl and 1 = boy. Age was measured using a single item measure where respondents were being asked about their month and year of birth.

Data Analyses

Data analyses were conducted using SPSS Statistics version 26. Initial data checks were being performed before testing the hypotheses. Pearson correlations are provided.

The method of Kenny & Baron (1967) is used to see if there is a mediating effect of family SES and family support on the relationship between different family structures and laughing gas use among adolescents. First, the main relationship between different family structures and laughing gas is being examined by using a logistic regression while controlling for gender and age. Intact families are used as referential category. In the second step the direct relationship between the different family structures and family SES will be examined using a linear regression. We again checked for gender and age. For this analyses the assumptions for linear regressions are checked. The assumption of linearity was checked using the box tidwell-test. With the Variance Inflation Factor (VIF) the multicollinearity is being checked. This must not be higher than 10. In the third step, we analyzed the relationship

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between the mediating variable family SES and laughing gas use with a logistic regression. The variables that are significant in all steps are included in the final model, in which the main effect of different family structures and laughing gas use is being tested. These steps will be repeated for family support as mediating effect.

Results

A correlation analysis was conducted to explore the associations between the dependent, independent, and control variables (see Table 1). Intact families showed significant correlation with almost all the variables. Adolescents of intact families indicated less laughing gas, a higher family SES and more family support. As seen in Table 1, there were also significant correlations between the dependent variable and control variables. For instance, laughing gas use among adolescents was more related to boys and older adolescents. Family SES showed a significant correlation with the control variables age, but not with gender. Family support showed a significant correlation with gender and age.

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Table 1

Pearson correlations Matrix of the dependent, independent and control variables

	Intact family	Single-mother	Single-father	Stepparent	Laughing gas	Family SES	Family support	Boy	Age
Intact family									
Single-mother	-.677**								
Single father	-.271**	-.051**							
Stepparent	-.460**	-.087**	-.035**						
Laughing gas	-.093**	.067**	.046**	.034**					
Family SES	.169**	-.181**	-.045**	-.036**	-,112**				
Family support	.111**	-.059**	-.057**	-.013	,025*	.093**			
Boy	.016	-.019	-.002	-.007	.036**	.007	.064**		
Age	-.055**	.032**	.050**	.010	.205**	.140**	.013**	.008	

* p < ,05, ** p < ,001

The main association between family structure and laughing gas use

A logistic regression was used to investigate the association between the different family structures and ever used laughing gas among adolescents, while controlling for gender and age (see Table 1).

First, in Table 2 Model 1, we did a logistic regression with the control variables gender and age with laughing gas. Results indicated that boys were more likely to use laughing gas than girls ($OR = 1.25, p < .001$). Also, older adolescents were more likely to use laughing gas ($OR = 1.50, p < .001$).

In Model 2 of Table 2, we added the variable family structure to the logistic regression. We used intact family as the reference category and compared this with single-mother families, single-father families and stepparent families. Adolescents from non-intact family structures were more likely to use laughing gas. First, when compared to adolescents from intact families, adolescents from single-mother families were almost twice as likely to use laughing gas ($OR = 1.91, p < .001$). Adolescents from single-father families were more than twice as likely to use laughing gas than adolescents from intact families ($OR = 2.23, p < .001$). Adolescents from stepparent families were also more likely to use laughing gas compared to adolescents from intact families ($OR = 1.75, p < .001$).

To see if there are differences between the different non-intact family structures, we changed the reference category from intact family to stepparent family. Compared to adolescents from stepparent families, adolescents from single-mother families ($OR = 1.09, p > .05$) or single-father family ($OR = 1.27, p > .05$) are at higher risk on ever have used laughing gas. However, it was not significant so there is no difference among the different non-intact family structures.

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Table 2

The effect of family structure on laughing gas with Family SES/Family Support as mediating factor

	Model 1			Model 2			Model 3			Model 4			Model 5		
	B	S.E	OR	B	S.E	OR	B	S.E.	OR	B	S.E.	OR	B	S.E.	OR
Single-mother				.646	.108	1.91**							.611	.106	1.80**
Single-father				.801	.210	2.23**							.790	.205	1.99**
Stepparent				.561	.152	1.75**							.520	.148	1.67**
Family SES							.059**	.021	1.06**						
Family support										-.191	.025	.83**	.203	.025	.84**
Gender	.223	.079	1.25**	.242	.081	1.27*	.214**	.079	1.24**	.214	.079	1.28**	.242	.082	1.47**
Age	.402	.024	1.50**	.399	.024	1.49**	.402**	.024	1.50**	.388	.024	1.48**	.389	.025	1.30**

*Note: * p < .05, ** p < .001. On dependent variable laughing gas use, controlled for gender and age with intact family as reference category*

SES as mediator in the association between family structure and laughing gas use

In Model 1 of Table 3, we examined the relationship between different family structures (with intact family as the reference category) and family SES using a multiple linear regression. Analyses showed a significant negative relationship between the different non-intact family structures and family SES. This indicated that adolescents from non-intact family structures have a lower family SES. Adolescents from single-mother families ($b = -1.09, t = -17.49, p < .001$), single-father family ($b = -.73, t = -5.19, p < .001$) or stepparent family ($b = -.24, t = -2.84, p < .001$) have a lower family SES compared to adolescents from intact families.

Next, we examined the association between family SES and laughing gas use by using a logistic regression. In Table 2 Model 3, the analyses showed that there was a significant relationship between family SES and laughing gas use ($OR = 1.06, p < .001$). A higher family SES increased the chance with 1.061 on using laughing gas. However, this was not in line with the expected direction which means that there could not be a mediation effect of family SES.

Tabel 3

Regression analyses testing the association between Family Structure and Family SES/Family Support

	Model 1 Family SES		Model 2 Family Support	
	B	S.E	B	S.E
Gender	.22**	.039	.02	.027
Age	-.004	.010	-.09**	.007
Single-mother	-1.09**	.062	-.25**	.043
Single-father	-.74**	.142	-.51**	.097
Stepparent	-.24**	.086	-.23**	.059

*Note: * $p < .05$, ** $p < .001$*

Family Support as mediator in the association between family structure and laughing gas use

To see if family support had a mediating effect on the relationship between family structure and laughing gas use the steps above were repeated using the variable family support instead of family SES. All analyzes were controlled for gender and age. We found a significant relationship between family structure and family support. In Table 3 Model 2, results showed that adolescents from single-mother families were receiving less family support compared to intact families ($b = -.25$, $t = -5.75$, $p < .001$). This is also the case for adolescents from single-father families ($b = -.505$, $t = -5.21$, $p < .001$) and stepparent families ($b = -.23$, $t = -3.93$, $p < .001$). These results indicated that adolescents from a non-intact family structure receive less family support than adolescents from intact families.

Next, we used a logistic regression to examine the effect of family support on laughing gas use. In Table 2 Model 4, analyses showed a significant relationship between family support and laughing gas use ($OR = .83$, $p < .001$). Receiving more family support decreases the use of laughing gas among adolescents. This indicated that adolescents who receive more family supports will be less likely to use laughing gas.

In Model 5 of Table 2, it was tested whether the effect of family structure on laughing gas use was still present when controlling for family support. The results showed that this relationship is still significant after adding family support to the model. More specifically, odds ratios changed from 1.908 to 1.899 for the comparison between single-mother families and intact families, they changed from 2.228 to 1.994 for the comparison between single-father families and intact families and they changed from 1.753 to 1.674 for the comparison between stepparent families and intact families. This indicated that the relationship between growing up in a non-intact family structure and laughing gas use is partially mediated by family support. However, the odds ratios changed minimally. To determine if there was a significant difference in laughing gas use among adolescents that perceive more family support, a Sobel test was conducted. The Sobel test (1982) confirmed a significant difference for adolescents from single-mother families (Sobel $Z = 3.50$, $p < .001$), single-father families (Sobel $Z = 3.48$, $p < .001$) and stepparent families (Sobel $Z = 3.53$, $p < .001$) which indicated that there is a partial mediating effect of family support.

Discussion

Considering the increase in popularity of laughing gas nowadays (NDM, 2019) and the scarce amount of research on this subject, this study aimed to investigate the association between different family structures and adolescent laughing gas use, as well as the mediating role of family SES and family support. In line with our predictions, family structure is a predictor of laughing gas use among adolescents. Our results showed that adolescents from single-mother families, single-father families and stepparent families are more likely to use laughing gas compared to adolescents from intact families. There was no difference found between the different non-intact families. Family SES and family support also play a role in this effect. Non-intact family structures have a lower family SES. However, there is no mediating effect of family SES found. Adolescents from intact families experience more family support than adolescents from single-mother, single-father and stepparent families. More family support decreases the use of laughing gas. Laughing gas use among adolescent from non-intact families can be partially explained by family Support.

First, it was hypothesized that adolescents from non-intact family structures are more likely to use laughing gas. When comparing adolescents from non-intact family structures (single-mother families, single-father families and stepparent families) to adolescents from intact-families, the results have shown that adolescents who grow up in a non-intact family structure use around twice as more laughing gas than adolescents from intact families. These findings are in line with the used literature in this study. So far, little is known about the exact consequences of different family structures on laughing gas use, but it is known that adolescents of non-intact family structures are more likely to use substances (McArdi et al., 2002; Vannassche et al., 2014). The stress-coping theory (1984) suggest that substance use, such as laughing gas, is a way to cope with stress. Adolescents from non-intact family structures are at higher risk to use substances (Gordon et al., 2020; McArdi et al., 2002; Vannassche et al., 2014) because they are exposed to different stressors (Gore et al., 1992). A separation could be a stressful period for an adolescent that unfolds over time (Amato, 2000). This period could provoke substance use such as using laughing gas (Coleman, 2013). Diminishing economic resource and decreased involvement of one of the parents that come along with a separation are also stressors that could increase the risk on substance use in a manner to deal with the situation (Amato, 2000; Coleman, 2013).

Therefore and, secondly it was hypothesized that there are differences among adolescents from different non-intact family structures and the use of laughing gas. Our results showed that compared to stepparent families, there is no difference between single-

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mother families and single-father families. This could be explained by the fact that adolescents from single-mother families, single-father families and stepparent families all experience the same stressors and deal with it in the same way.

Next, the third hypothesis stated that adolescents from non-intact family structures have a lower family SES compared to adolescents from intact families. In line with our hypothesis, our results indeed indicated that adolescents from single-mother families, single-father families and stepparent families have a lower family SES compared to adolescents from intact families. This is in line with the used research that stated that a disruption of a family household leads to diminishing economic resources and material prestige (Amato, 2000; Bjarnason, 2003; Coleman, 2013). In addition, the prediction also was that adolescents with a low family SES are more likely to use laughing gas. Our findings are in contrast with this prediction. Results showed that adolescents with a higher family SES use more laughing gas. This is not in line with previous research that has stated that adolescents with a low SES are more likely to use laughing gas in order to cope with certain stressful situations (Coleman, 2013; Doane et al., 2012; Gustavsen et al., 2016). An explanation may be that adolescents from non-intact families may have no economic resources to buy laughing gas compared to adolescents from intact families because of their lower family SES. According to Kothakota (2019) parental separation reduces a household's income. If adolescents from non-intact families cannot afford to buy it, they will be less likely to use it. This means that the availability of financial resources is associated with more substance use among adolescents. However, compared to other substances laughing gas is relatively cheap, so we need to investigate this association more.

In line with our fourth hypothesis, we found that adolescents in non-intact family structures experience less family support than adolescents from intact families. Results showed that adolescents from single-mother families, single-father families and stepparent families indeed received less family support compared to adolescents from intact families. This is in line with previous research that stated that the different non-intact families may have less resources, such as time, to be dedicated and supportive compared to intact families (McLaughlin et al., 2016). As predicted, family support is also a predictor of laughing gas use. More family support reduced the use of laughing gas. This can be explained by the importance of family support to make a healthy and stable transition from childhood to adulthood (Newland, 2014). Adolescents that receive less family support are more likely to experience situations as stressful (Agnieszka & Zalewska, 2011). Therefore, their risk to use substances increases (Becona et al., 2012; Vermeulen-Smit et al., 2015) because it is a way to

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cope with stress (Agnieszka & Zalewska, 2011). Lastly, results showed the relationship between family structure and laughing gas can be partially explained by family support.

Strengths and Limitations

To the best of our knowledge, there is not much research done about the use of laughing gas. Laughing gas has risen in popularity in the last few years among adolescents. Previous research has mainly focused on other substances such as alcohol and XTC. There is not much research about laughing gas itself. Information on and knowledge of the effect of family support and family SES in relation to family structure and laughing gas use contributes to the development of (more) effective prevention efforts in reducing laughing gas use among adolescents. Our findings can help target the vulnerable group and make it possible for policymakers to make new interventions. This study adds to the limited literature about laughing gas as we focused on the effect of different family structures. In addition, the sample of this study is relatively large which reduces the margins of error and increases the external validity of this study.

Despite the strengths of this study, we also found some limitations. The questionnaire did not include questions about divorce. We are not sure to what extent adolescents have experienced the separation of their parents and which impact this had on their substance use. For future research, it could be interesting to investigate to what extent experiencing a separation could influence substance use among adolescents. Furthermore, the use of laughing gas is still little compared to other substances. Since it becomes more and more popular, it would be interesting to use longitudinal data in order to see if laughing gas use increases among adolescents. Lastly, we did not make a distinction between adolescents in co-parenting situations and non-intact family structures. It is possible that adolescents reported living with only their mother, but also spend time at their father's home. This could have influenced adolescents' family SES and perceived family Support, which in turn could lead to different laughing gas use outcomes.

Conclusion and implications

Overall, we can conclude that different family structures predict laughing gas use among adolescents. Compared to adolescents from intact families, all adolescents from non-intact family structures used more laughing gas. Our findings showed that adolescents from single-mother families, single-father families and stepparent families are more disadvantaged (lower family SES and less parent support) which makes them more likely to use laughing gas. There

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is no difference found within the different non-intact family structures. Family SES does not mediate this effect, but family support does.

However, it is not clear if parents of adolescents from non-intact family structures have co-parenting. Further research should look deeper into the family composition of adolescents to see if this is the case and to what extent this influences their laughing gas use. This study did show that family composition is a predictor of laughing gas use. Policy makers can use these findings to create prevention programs for adolescents from non-intact family structures to reduce their laughing gas use.

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